How does vowel harmony develop?

Evidence from Behoa, a language of Indonesia

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Preliminaries

How does vowel harmony develop?

Recent work indicates a renewal of interest in diachronic explanations for synchronic phenomena (esp. Blevins 2004, see also Anderson 2016).

This paper is about two unanswered questions (Hyman 2002):

1. Where does vowel harmony come from?
2. What other factors enhance or impede its development?

Gap in literature

- Ohala (1994) suggested that the origin of VH is fossilized V-to-V coarticulation.
- Experimental research on perception and production affirms this possibility (Beddor & Yavuz 1995, Busà & Ohala 1999, and others).
- Little to no diachronic work to confirm that this happened.
- VH is usually attributed to inheritance from a proto-language = not explanatory.

Case study from Behoa, a language of Central Sulawesi

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Definition of vowel harmony

I adopt a descriptive definition of vowel harmony. In a vowel harmony system:

1. Vowels agree for one or more phonological features in a domain.
2. The domain may be a root, stem, word, or prosodic unit.
3. Harmonic alternation of vowels is observed for certain morphemes.

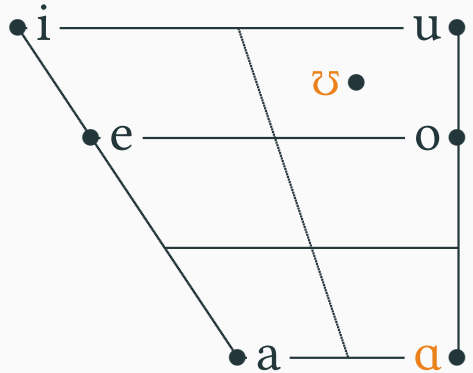
Case study: Behoa Vowel Harmony

Behoa Language

- Behoa (*basa Behoa*, ISO-639-3:[bep])
- Austronesian language
- 10,000 speakers in 8 villages
- Highlands of Central Sulawesi province

Behoa vowels

Figure 1: Behoa Vowel Phoneme Inventory



- Behoa has two unusual vowels for this region.
- Other neighboring and closely-related languages (except Bada) have a five vowel system.

Low vowel agreement

Inherited roots in Behoa are predominantly disyllabic (see Blust 2007). All disyllabic roots in Behoa agree for backness on the low vowels.

Table 1: Low vowel agreement for disyllabic roots[1]

dana?	'sword grass'
landa?	'net'
haβa	'python'
ŋamba	'broad place'
bɑdɑ?	'turmeric'
mpɑndɑ?	'goose'
kɑlɑ	'bracelet'
βɑrɑ	'winnowing basket'

No disyllabic roots contain *a…ɑ, *ɑ…a.

Harmonic allomorphic alternations

The nominalizing suffix has two allomorphs -a/-ɑ.

(1) a. /ɑnti/ ‘bring’ + /-ɑ/ ‘NMLZ’ ⟶ [ɑˈntiɑ] ‘baggage’

b. /ande/ ‘eat’ + /-ɑ/ ‘NMLZ’ ⟶ [aˈndea] ‘cooked rice’

This alternation also occurs with the 1st person absolutive -aʔ/-ɑʔ.

(2) a. /mo-/ ‘INTR’ + /tɑmbi/ ‘house’ + /-aʔ/ ‘1s.ABS’ ⟶ [motɑˈmbiɑʔ] ‘I got married’

b. /mani/ ‘still’ + /-aʔ/ ‘1s.ABS’ ⟶ [maˈniaʔ] ‘I still…’

No pre-tonic harmony.

Behoa has penultimate stress. Prefixes, which are always pre-tonic, do not show vowel alternations.

(3) a. /ka-/ ‘NMLZ’ + /haβiʔ/ ‘slave’ ⟶ [ka-haβiʔ] ‘slavery’

b. /ka-/ ‘NMLZ’ + /βɑtɑ/ ‘stick, tree trunk’ ⟶ [ka-βɑtɑ] ‘footpath’

Apparent fossilized compounds and prefixes as well as recent loanwords also show non-agreement in pre-tonic position

Form	Category	Meaning
iainina	adverb	‘earlier’
agɑiɑnɑ	conjunction	‘but’
kapuitɑ	noun	‘constipation’
βɑtɑmando?	noun	‘corpse’
mantegɑ	noun	‘butter’ (<Ind.)

Summary of Behoa VH

1. Behoa has a vowel harmony system evident in agreement of low vowels for backness which is active in a specific domain.
2. The domain of VH is the tonic and post-tonic syllables.
3. Harmonic alternations for vowel-initial suffixes are observed.

Diachronic development

- PMP *a > Behoa /ɑ/ is a recurrent sound change in the final syllable of roots.
- Regularly conditioned by a final consonant, *-m, *-n, *-ŋ, *-l, or *-R, and sporadically occurs with *-k.
- All final consonants were later lost or reduced to /ʔ/ in Behoa.

Table 2: Conditioning of /ɑ/ in Behoa[2]

*-C	PMP	Pre-Behoa	Behoa	Gloss
*-m	*najam	*naj[ɑ]ŋ	nɑrɑ	‘tame, domesticated’
*-n	*bulan	*bul[ɑ]ŋ	βulɑ	‘moon, month’
*-ŋ	*balaŋ	*bal[ɑ]ŋ	bɑlɑ	‘scar’
*-l	*kabal (WPMP)	*kab[ɑ]ŋ	kɑbɑ	‘thick’
*-R	*bulaR	*bul[ɑ]R	bulɑ	‘white’
*-k	*anak	*an[ɑ]k	ɑnɑʔ	‘child’

Evidence of coda velarization

Proto-Seko, which subgroups with Badaic (Behoa, Bada, & Napu), shows that final nasals and *-l passed through a velar stage. Proto-Seko also retained *-k, while reducing other final stops to /ʔ/.

Table 3: Proto-Seko final velarization. (Data from Laskowske 2006.)

PMP	Proto-Seko	gloss
*enem	*ùnuŋ	‘six’
*quzan	*uraŋ	‘rain’
*gatel	*katiŋ	‘itch’
*anak	*anak	‘child’

I conclude that Behoa /ɑ/ results from backing before a dorsal consonant in an earlier stage: context-dependent vowel variation.

Spreading of [+back] in Behoa

The pattern of agreement that we see in Behoa results from spreading of [+back] from ultima to penult. This coincides with loss of the triggering final consonant, e.g. it is transphonologization.

Table 4: The diachrony of low vowel agreement

PMP	Behoa	Gloss	PMP	Behoa	Gloss
*najam	nɑjɑ	'tame'	*mata	mata	'eye'
*daqan	dɑʔɑ	'branch'	*paqa	paʔa	'thigh'
*bataŋ	wɑtɑ	'body'	*sayat	haaʔ	'slice thickly'
*kapal (WPMP)	kɑpɑ	'insensitive'	*panas	pana	'stinging'
*pakpak	pɑpɑʔ	'flap (wings)'	*mamaq	mamaʔ	'betelnut'

Steps of VH Development

Table 5: Steps of VH Development in Behoa

No.	Step	Description
(1)	Context-dependent variation	/a/ ⟶ [ɑ] triggered by a dorsal C.
(2)*	Transphonologization	Lost of final C, *a splits to /a/, /ɑ/.
(3)*	Spreading creates agreement	Coarticulation spreads [+back] to penult.
(4)	Spreading is extended	Agreement extended into suffixes.

Implications

A diachronic perspective

- Behoa is a rare case study that shows the diachronic steps of development of VH.
- Allows us to see synchronic phenomena which are similar to Behoa's various stages as related to VH, e.g. pre-harmony or post-harmony.
- Identify factors which favor or preclude the rise of vowel harmony.
    - Three types of pre-harmonic systems
    - One type of post-harmonic system.

Type I: Context-Dependent Variation

Many languages have context-dependent vowel variation.

- For example, Chinese (Chao 1968) and Arabic (Ghazeli 1977) are both reported to have backing of /a/ triggered by back consonants.
- Existence of two categories of vowels is prerequisite to VH.
- In these cases, the trigger is not lost so the [+back] feature doesn't develop into the axis of harmonic agreement.

Type I: Context-Dependent Vowel Variation

- Context-dependent vowel variation can lead to the rise of VH.
- It creates two categories of vowels, that vary by a feature.
- But if the trigger is not lost, the feature remains dependent and localized.

Type II: Transphonologization without spreading

In some languages, new vowel contrasts have been created by transphonologization, but without subsequent spreading.

- In Proto-Seko, final glottal stop (PMP *-q) was lost and transphonologized as contrastive vowel length (Laskowske 2006).
- In French, nasal codas attested in Latin were transphonologized as contrastive vowel nasalization (Rochet 1976).
- In both cases, no spreading of the new vowel feature occurred.
- I suggest this is because spreading would erase other cues for lexical contrast. Spreading was thus blocked.

Type II: Transphonologization without spreading

- Transphonologization can create vowel harmony.
- It creates two classes of morphemes, which vary by a vowel feature.
- But if the feature does not spread, there is no agreement pattern.
- Must be able to spread the feature without overwriting large numbers of lexical contrasts.

Type III: Spreading without fixed association

- In Javanese, final-a mutation changes /a/ to [ɔ] in the final syllable. This spreads leftward within roots (Kenstowicz 1985, Oglobin 2005).

  (4) /kanɖa/ ⟶ [kɔnɖɔ] ‘tell’

- Anchored at the right edge of the word, and does not spread through the morpheme boundary between suffix and stem.

  (5) /kanɖa-ni/ ⟶ [kaɳɖa-ni] ‘tell to s.o.’

  (6) /N-dolan-a/ ⟶ [n-dolan-ɔ] ‘play!’

- The feature never develops a fixed association with any class of morphemes. And the “domain” is unusual = not a root, stem, word, or prosodic unit.

Type III: Spreading without fixed association

- Spreading of a vowel feature through coarticulation can create VH.
- Creates agreement patterns.
- But if the spreading does not become associated with a fixed set of morphemes or a salient domain, we don't see robust VH.

Type IV: Loss of vowel harmony

Finally, a subsequent change in syllable patterns can erode vowel harmony.

- Rotuman long and short forms (Blevins & Garrett 1998)
  - First, V-to-V coarticulation spreads vowel quality from ultima to penult.
  - Then, loss of unstressed final syllable creates short forms.

(7) *fúti > *fýti > fýt ‘to pull’

- Germanic umlaut
  - First, V-to-V coarticulation from suffix vowels to stem vowels.

(8) OHG *gast* ~ *gesti* ‘guest, guests’ (Iverson & Salmons 1996)

  - Then, loss of the unstressed suffixes creates ablaut alternations.

(9) English *foot* (sg.) ~ *feet* (pl.)

In both cases a temporary harmonic stage emerged through coarticulation, but was later lost due to unfavorable prosodic conditions.

Conclusion

- Through the Behoa case, we see that vowel harmony is an extension of the processes active in assimilation, metaphony and allomorphic alternation.
- It also shows that VH systems develop only under favorable conditions which include prosodic, morphological, and lexical factors.
- More diachronic studies are needed to identify possible pathways of VH development, their relative frequency, and their relationship to typological properties of synchronic systems.

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Notes

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2. Reconstructed forms are from Blust & Trussel (2018) and represent Proto-Malayo-Polynesian (PMP) forms unless otherwise noted.

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